THE PREDINATUR PROJECT: EDUCATIONAL RESOURCES FOR PROMOTING PUPILS' CONTACT WITH NATURE

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Abstract

The PREDINATUR project began in 2017 with the purpose of promoting the contact of pupils of primary school with nature. As a result of an increasingly urban experience and the use of technological devices in indoor settings, children today are moving away from the natural world. School can help to counteract this trend by promoting pupils' contact with nature. But with their focus on learning, teachers do not always have educational resources to promote outdoor activities.

Thus, this project aims to support the visitation of natural areas in Portugal and Spain and to stimulate similar projects. To this end, a website was created for free dissemination of educational resources. The first resources were designed by pre service teachers from two higher education institutions, respectively for Lagoa Pequena, Portugal (Natura 2000 under the Birds and Habitats Directives of European Union), and for Las Tablas de Daimiel National Park, Spain (a wetland on the La Mancha plain).

At this stage, the three resources made available online for Lagoa Pequena (a small lagoon that is included in the Albufeira Lagoon) have already been tested by 16 teachers and 65 pupils of the 6th grade of schooling (ages 10 to 12) from two different schools. From the results of this assessment, the user teachers emphasized their integrative character and the use of digital resources as very motivating for the pupils. However, a few suggested, for instance, the inclusion of more questions directed to get information from the outdoor panels and the discussion of the more complex activities at the end of the visit. These and other suggestions will be addressed in the reformulation process of the resources. The pupils highlighted positively the use of the digital resources and a few criticized the fact that some activities have a lot of maths included. Some disturbing factors during the visit were also mentioned, especially by the pupils of one of the schools, like the weather conditions and the presence of stinging plants and insects, affecting their enjoyment of the place and attention during the activities.

In the near future, the project intends to design other educational resources for natural areas also obeying to the cycle of test and reformulation, and to provide the website available in three languages (Portuguese, Spanish and English), to facilitate the exchange of ideas related to the present issue among the research community.

Keywords: Contact with nature, educational resources, primary school.

1 INTRODUCTION

Contact with nature can happen in different ways. [1] [2] Kellert (1997, 2005) differentiates between three types of experiences that correspond to a distinct degree of involvement with the natural world: symbolic contact, associated with the images of nature in the media; indirect contact, promoted in places where nature is managed (botanical gardens, zoological and pedagogical farms); direct contact, provided in natural and semi-natural places.

The increasingly tendency to live in urban areas, the access to sophisticated technological devices that imprison young people at home and in other closed spaces, and the connection to a consumer society explain why today's children are gradually losing direct contact with the natural world. For instance, [3] Orr (2002) is especially critical to the dominant consumer society model which pushes people to commercial places and makes them dependent on television and the internet. And while

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children begin early to know the threats that the planet is facing, like global warming and the loose of biodiversity, their physical and intimate contact with natural contexts is disappearing.

Children still have contact with nature due to the information conveyed by the media, through school activities or through visits promoted in a family context. But, as [4] Louv (2010) states, the knowledge that pupils acquire is almost always distant, strange and televised. Therefore, the majority of the experiences that are still occurring are often associated with the viewing of programs about nature in the media, the symbolic contact, or confined to places where nature is managed, like botanic gardens, zoos and pedagogical farms, the indirect contact ([2] Kellert, 2005), places which are frequently seated in or near the cities. A recent study by [5] Strecht-Ribeiro & Almeida (2013), involving 123 children from 4 schools in the 1st cycle of schooling in the Lisbon region, concluded precisely that urban garden spaces and theme parks were clearly the places where children could still establish a regular contact with elements of nature.

Several consequences from this situation are serious in relation to the integral development of children and to the conceptual knowledge they develop about the natural world; (i) ignorance and devaluation of the natural heritage that exists in their region and a poor awareness of the need for its preservation; (ii) a better knowledge of distant natural places than of surrounding ones due to the broadcasting of films in the media; (iii) unfamiliarity of the natural processes, and of the dangers associated with their disturbance and the origin of the natural elements with which they coexist in their daily lives; (iv) the development of misconceptions about the needs of the other living things. For example, [6] Myer (2007) and [7] Almeida et al. (2017) found that visits to the zoo accentuate several wrong ideas, like the perception that these places are the animals' habitat and that freedom is not one of their needs; (v) lack of contact with places that provide a multiplicity of stimuli which develop all pupils' senses and contributes to their mental, physical and spiritual sanity and that are also responsible for the promotion of curiosity and imagination, cooperation, self-esteem and self-confidence. Even challenge, anxiety, fear, and danger are stimuli that, if properly dosed, increase the advantages mentioned above ([1] Kellert, 1997); (vi) impoverishment of experiences leading to aesthetic, scientific and emotional development, which are possible through the connection with nature.

School can help counteract this trend by promoting students' contact with natural places. But with its legitimate concern for students' learning, teachers do not always have the appropriate educational resources to promote outdoor activities, and sometimes they are inadequate for certain ages or years of schooling. Also, non-formal learning entities, especially the interpretive centers of protected areas, do not always offer either the most adequate resources to promote learning in these places, or enabling an empathic development on the part of the child towards nature.

Institutions linked to teacher training and non-formal learning entities have the responsibility of working together to change the situation already described, enhancing the educational value of natural and semi-natural areas, contributing to their knowledge and enjoyment. As [8] Kola - Olusanya (2005) points out, these are places where students can learn in a more integrated and contextualized way, and learn to respect nature, understanding the threats of human action, but also the positive actions already taken in their preservation.

The region of Lisbon has a large number of parks, reserves and classified sites (Natural Park of Sintra-Cascais, Natural Park of Arrábida, Natural Reserve of the Tagus Estuary, Albufeira Lagoon, etc.), revealing an enormous ecosystemic diversity. In some of these areas, the natural and built heritage is harmoniously related. In others, tensions between human activity and the preservation of nature are present. The region of Castilla-La Mancha, in Spain, has some similarity with the region of Lisbon with respect to the richness and diversity of areas of natural interest, like the Tablas de Daimiel and Cabañeros.

The PREDINATUR project arose precisely from the need to promote the contact of pupils of primary school with natural contexts, a contact that seems essential considering the advantages listed above. To do this, three ways were considered essential: (i) to build educational resources that facilitate more or less structured approaches to natural sites; (ii) to involve pre-service teachers in the design of resources that can be used by the educational community; (iii) to promote the articulation between entities of formal and non-formal education in the task of mobilizing schools for the visitation of this type of spaces. It is then necessary to evaluate the resources designed, to reformulate them when necessary and simultaneously to verify their impact in the learning of school contents, degree of empathy and recognition of the importance of the mentioned spaces as well as awareness to environmental issues.

Thus, the main objectives of the project are:

1 To build a digital platform for free dissemination of the project and sharing of the educational resources designed, enabling other contributions and criticisms;

2 To design resources of an interdisciplinary nature, facilitators of a more integrated learning;

3 To design resources with different degrees of structuring, some of them appealing to technological support, allowing a greater degree of freedom in the pupils' learning process;

4 To establish one or more partnerships with non-formal institutions;

5 To involve non-formal and formal education entities in the dissemination, testing and reformulation of the resources designed;

6 To check how children interact in natural spaces, promoting environmental appropriate behaviors;

7 To promote aesthetic fruition and enjoyment of the places visited, and the increase of awareness for environmental issues;

8 To assess all the steps of the project and to promote the dissemination of results in congresses and through articles.

The project development proceeds, and the results present in this paper include only the work developed in one of the natural areas mentioned above, the Albufeira Lagoon, which involved a partnership with The Portuguese Society for the Study of Birds (SPEA– Sociedade Portuguesa para o Estudo das Aves).

2 METHODOLOGY

After presenting the main objectives of the project, it is important to highlight the principles that underpin the conception and evaluation of the educational resources already conceived and to idealize in the near future, and also to explain the instruments used to assess those educational resources and to verify the degree of satisfaction of the pupils involved in the outdoor activities promoted by the research team.

2.1 Principles for the design of educational resources

The team of the project has assumed the task of preparing a set of proposals that want to reconcile the acquisition of scientific and environmental contents included in the curricula with the aesthetic and sensorial enjoyment of the areas visited, also respecting the different learning styles and interests of pupils.

The resources conceived so far, and those to be conceived in the near future, seek to be interdisciplinary, since they are intended for pupils from the first six years of schooling, where the connection among different areas of content is stronger. In order to achieve this aim, the research team is composed by teachers from different areas of knowledge, able to respond to the scientific and pedagogical challenges of an interdisciplinary approach, capable of articulating contents from science, mother tongue, mathematics and visual arts. This team already possess some previous interdisciplinary articulation work, achieved in other initiatives and training modalities.

The non-formal education entities, with which an articulated work has been achieved, had an important role in giving scientific and technical support during the visits, also helping the process of visitation of the selected natural areas.

Some of the educational resources were designed to include the use of technological devices. This use was intentional to help students to understand that they can be important tools in outdoor contexts, allowing for a better learning. The educational resources, while focused on conceptual learning, also try to combine learning with the fruition of nature, stimulating the development of children's creative potential. For this purpose, the resources promote the exploration and discovery of places and autonomous research, especially through the use of QR codes that connect visitors to WebPages. Other principles defined by [9] Almeida & Vasconcelos (2013) are being taken into account like the following: the encouragement to read the information present in outdoor panels, the exploration of different scientific processes (observation, measurement, classification, inferring, controlling variables, etc.) and the approach of ethical problems, which are essential when addressing environmental issues. At the same time, some resources are based on the principles of free choice

learning, a line where learning is more widely determined by the learner's choices due to greater autonomy and choice of the aspects that each learner wants to know, facilitating an empathic relationship with nature ([10] Heimlich & Falk, 2009). This approach also seems a way to attenuate the so-called "novelty effect", initially addressed by [11] Orion (1993), who discusses the factors that interfere with students' learning in a space that is unknown to them and tries to find solutions to minimize them.

The designers of the educational resources are pre-service teachers, who are also involved in the consequent process of testing and reformulation, under supervision of the members of the research team. Until now, 15 pre-service were involved in the design of five educational resources for Lagoa Pequena, and the three best proposals were the ones already tested and available on the site of the project. Each proposal has a name and a number for a better identification especially during the testing process.

2.2 Assessment of the resources and of the visits

From the methodological point of view, the resources produced and selected to figure at the homepage of the project are subject to a cycle of conception, testing and reformulation. This process involves the research team, pre-service teachers, in-service primary school teachers and pupils from real contexts.

For that, two questionnaires were designed, one for the applicators of the resource and the other for the pupils involved in it. Both questionnaires are available in the site of the project and can be answered on line. The question items are shown in Table 1 and Table 2.

To analyse the answers of the respondents to the open questions a content analysis was used and the frequency of each different idea calculated. In the case of the answers to the closed questions, the frequency of each possibility was also calculated.

The process of testing the three educational resources mentioned above involved 16 teachers and 65 pupils from the 6th year of schooling, aged between 10 and 14 years old, from two different schools in the Lisbon area (33 pupils from school A and 32 from school B). It was possible to conciliate the pupils' visits on the same day, and pupils from school A visited the place during the morning and pupils from school B during the afternoon. Both schools are attended by students of a low to a medium social level with learning difficulties, who rarely visit natural areas in a familiar context.

Table 1. *Structure and content of the questionnaire for applicators, including the classification of the type of questions included.*

Questions	Type of question
Please, indicate the name of the resource used.	Open question
The resource corresponds to the objectives / contents proposed.	Closed question (likert scale 1 to 5)
The instructions for resource administration are clear.	Closed question (likert scale 1 to 5)
Would you suggest the resource to a colleague? Yes/No. Why?	Closed question Open Question
What changes would you make in the resource?	Open question
How does the resource allow students to enjoy the space visited?	Open question
If you used a digital resource, highlight the positive and negative aspects that you found in it.	Open question

Table 2. *Structure and content of the questionnaire for pupils, including the classification of the type of questions included.*

Questions	Type of question
Please, indicate the name of the resource used.	Open question
The learning process...	
Write something you already knew about Lagoa Pequena.	Open question
Write something you learned about Lagoa Pequena.	Open question
Mention a difficulty that you felt during the activities.	Open question
Opinion about the visit	
Please, indicate what you liked most.	Open question
Please, indicate what you disliked most.	Open question
Would you return to this place again, for example, with your parents or friends? Yes/No. Why?	Closed question Open question
Your opinion about the educational resource	
What changes would you make in the resource?	Open question
Were the activities adequate considering the syllabus of Science?	Closed answer (likert scale 1 to 5)
The place...	
This place made you feel ... cheerful, upset, uncomfortable, afraid, bored, free, scared, amused, happy (you can select more than one option)	Closed answer

3 RESULTS

The educational resources were shared and discussed by all the pre-service and the in-service teachers before the process of testing. During the process of testing, a pair of teachers was responsible for a group of 5 to 6 pupils, each group exploring one of the three resources available. Due to the previous knowledge of the resources, all the teachers participated in the assessment of the three resources but, of course, they were more critical of the one (or ones) they tested with the groups they accompanied.

The result of this assessment was very positive, since they all considered that the resources corresponded to the objectives and contents proposed, were adequate to the cycle of schooling of the pupils and, in general, the instructions were clear and helpful. In conformity, each teacher stated that he/she would recommend them to other colleagues, due to their quality and to the relevance of the activities, and would not change anything. Even so, five teachers gave a few suggestions for reformulation. They were: the inclusion of more questions related to the outdoor panels, the inclusion of images of males and females in the case of the birds with sexual dimorphism, the simplification of some instructions, the discussion of more complex activities at the end of the visit in the rest place at the entrance.

All the teachers considered that the resources promote the contact with nature and stimulate the direct observation, but also give autonomy for pupils' exploration of the space. The teachers that tested the digital resources highlighted the advantage of not using a paper sheet activity and also the motivating role of researching new information required in certain checkpoints.

Considering now the results of the assessment process made by the pupils, it is important to refer that, before the visit to Lagoa Pequena, the teachers of the two schools made a brief outline of what they were going to see. Even so, 10 pupils (30%) from school A and 7 (21.9%) from school B confessed to know nothing about Lagoa Pequena before the visit. Those who reported something about the place mentioned mainly that they would go to see birds: 16 - 48%, students of school A and

23 - 71.9% of school B stated this intention. The other pupils of both schools mentioned other aspects, but with a very low frequency, like the geographic location, the presence of a lagoon or that in the space it was not allowed to make noise.

Each educational resource has a specific thematic focus, and pupils highlighted different aspects of the learning process, since they were divided in groups and each group explored one of the three available resources. Therefore, each educational resource was tested by around 20 pupils. Even so, given the nature of the place and due to the fact that all the resources explored the birds issue, learning something about these animals turned out to be the most mentioned reference by the pupils of both schools. However, since resource number 2 was also concerned with the study of the most frequent trees in the area, some pupils stressed the learning of several concepts related to this issue. It was the case of 7 pupils from School A who stressed that they learned that plants transpire and breathe, and 2 from school B who pointed out that they had learned some features of the trees.

Also important was the fact that some students from both schools emphasized that they learned the importance of certain behaviors and values in relation to nature, such as the importance of silence in bird watching, or the importance of preserving nature and birds freedom.

It should be noted that the overwhelming majority of the students stated that they did not feel any difficulties when solving the activities. Nevertheless, three pupils from school A pointed out that it was not always easy to see the birds, and another one referred the difficulty of working with binoculars. The pupils of school B listed the following difficulties: three mentioned the use of binoculars, two the birds' species identification and one the activities involving mathematics.

The degree of satisfaction of the pupils of both groups concerning the visit is shown in Figure 1.

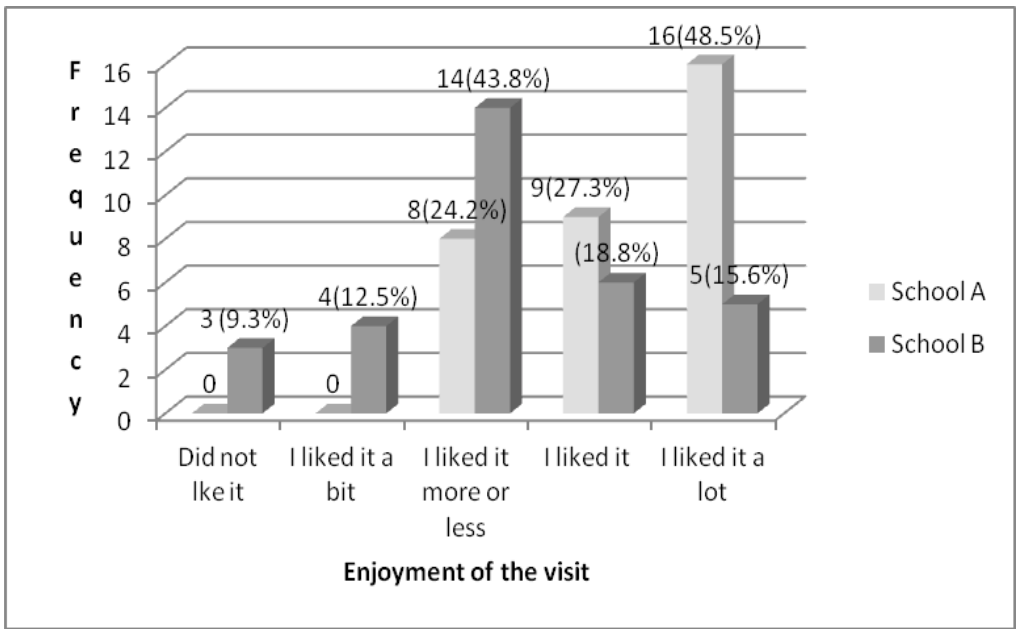

Figure 1. Degree of satisfaction of the pupils in relation to the visit to Lagoa Pequena, in a scale from 1 (did not like it) to 5 (I liked it a lot).

It is possible to conclude from data analysis that pupils from the two schools assessed the visit very differently. Thus, most of the students from school A (25) liked the visit or liked it very much. On the contrary, those from School B liked much less the visit, since 14 liked it more or less and the others chose the other items almost with the same frequency. The reasons that motivated these differences are systematized in Table 3.

Table 3. *Aspects that pupils from both schools said they most liked and disliked during the visit.*

What pupils liked most in the visit	**Sch. A**	**Sch. B**
-To watch the birds in the lagoon	23	15
-To listen to the sounds of nature	1	
-To use binoculars	2	1
-To spend time with mates	1	-
-To be in nature	1	4
-To access the internet during the activities	-	1
-To buy souvenirs	-	3
-To have snacks	-	8
-To enjoy everything	5	-
What pupils disliked most in the visit		
- The feces of the common genet (*Genetta genetta*) in the soil	4	-
- The walkways that inspired danger	4	1
- The stinging insects and plants	-	9
- It involved a lot of walk	-	5
-The weather was hot		4
-We can visit only a few places	3	-
-The activities had a lot of maths	3	5
-There are not many birds to be seen	1	4
-I sweated a lot	2	-

The reasons given by the pupils allow a better understanding of the differences between the two groups. Starting with the more positive reasons, the pupils highlighted especially the bird watching activities, an aspect mentioned by 23 pupils from school A and 15 from school B. All the other reasons had a lower frequency, although 8 pupils of the school B mentioned the snacks, which seems a not particularly positive reason to highlight in a visit. Curiously, the use of digital resources is scarcely mentioned by the pupils, although there has been an adhesion to their use.

The reasons for disliking the visit had a higher frequency and diversity in pupils from school B. They highlighted as negative elements the hot weather, the presence of stinging insects and plants and having to walk a lot. In fact, the pupils from school B visited the place during the afternoon, in a day with high temperature. But the reasons mentioned also reveal a lack of contact with nature, since several aspects that are common in natural places were seen as a source of disturbance of the individual well-being. The pupils from school A also highlighted a few negative aspects. Among them, is the presence of feces of genet on the soil, a particularly curious aspect, revealing a certain lack of understanding of the dynamics of a natural place.

Another indicator of how pupils from both schools assessed the visit differently was the number of those who said they would like to return to the place with their families and friends. In fact, all the pupils from School A stated that they wanted to return to Lagoa Pequena and only 12 (37.5%) from School B expressed the same wish. The reasons are systematized in Table 4.

Table 4. *Reasons invoked by pupils to return or not to Lagoa Pequena with their families and friends.*

I would like to return because…	Sch. A	Sch. B
- I liked the place a lot	9	3
- It is a funny place	8	4
- I could explore and learn more	8	
- It is a beautiful, calm and pleasant place	4	
- I think they will enjoy it	2	3
- They will learn a lot of things	2	1
- It is good to be in nature	-	1
I would not like to return because….	-	
- The place is not particularly interesting	-	8
- The place has a lot of insects	-	4
- My parents would not like it	-	1
- It is a very hot place	-	1
- I have already seen it once	-	1
- It has very few animals	-	1
- It is far and we don´t have a car	-	1
- We don´t have binoculars	-	1

Regarding the adequacy of the activities and their interest, the results are shown in Table 5.

Table 5. *Assessment by pupils from both schools of the adequacy of the activities concerning the science syllabus and their interest using a scale from 1 to 5.*

	School A					School B				
	1	2	3	4	5	1	2	3	4	5
Adequacy	-	-	5 (15%)	8 (24.5%)	20 60.5%)	3 (9.4%)	1 (3.1%)	6 (18.7%)	11 34.4%)	11 (34.4%)
Interest	-	-	4 (12.2%)	10 (30.3%)	19 (57.3%)	6 (18.7%)	4 (12.5%)	8 (25%)	9 (28.2%)	5 (15.6%)

The pupils from school A assessed much better the adequacy and interest of the activities, revealing again a greater interest for the dynamics of the visit. Finally, the feelings that the pupils expressed related to the visit to Lagoa Pequena are presented in Figure 2.

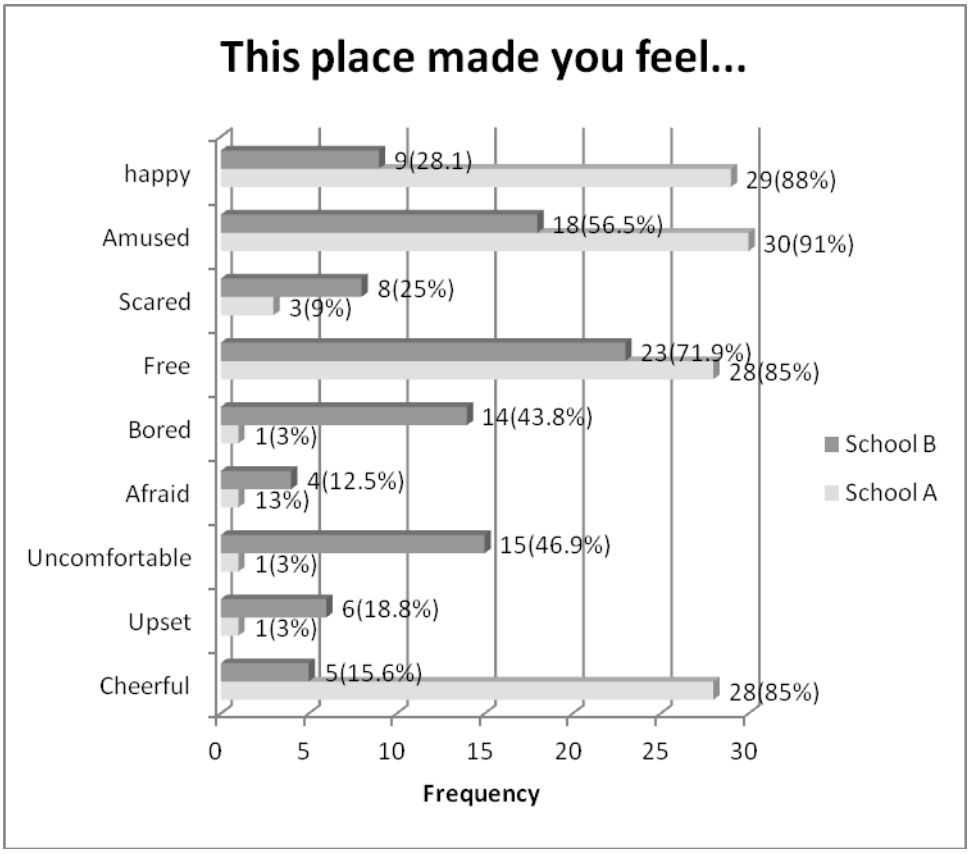

Figure 2. The feelings expressed by the pupils from both schools after visiting Lagoa Pequena. The pupils could select the number of feelings they want.

From the data analysis, the feelings most evoked by the pupils of school A were cheerful, free, amused and happy, mentioned by practically all of them. All other feelings, with a more negative meaning, had a residual frequency. Contrarily, pupils from school B, selected feelings with more negative meaning such as uncomfortable, bored, scared and upset. Nevertheless, 23 (71.9%) of the pupils from this school felt free during the visit and 18 (56.5%) stated they had fun.

4 CONCLUSIONS

The PREDINATUR project aims to promote the direct contact of children and young people with nature, a contact that has been decreasing in the last decades, with the consequences mentioned above. The availability of educational resources aimed at areas of natural interest is a way to counteract this trend, encouraging teachers to visit them with their students. For that reason, these resources must be adapted to the students' age level, should explore curricular contents and allow, simultaneously, the enjoyment of nature.

The first three educational resources that were already tested show that this task is possible, and the cycle of design, testing and reformulation proves to be a contribution to their improvement and consequent quality. The trips already done with the pupils from two schools show that the contact with nature can be something motivating but can also involve problems. Our urban children do not always welcome the challenges they face in nature. Weather conditions, like excessive heat or cold, the presence of stinging insects or plants, or the need of walking during a certain time, are examples of factors that interfere with the success of visits and should be taken into account when planning outdoor activities. [9] Almeida and Vasconcelos (2013) discuss several of these interference factors, and their ideas, based on their experience of visiting natural sites with students of different ages, are being taken into account even more deeply in the planning process of future trips.

The project is now in a development phase involving the design of more educational resources for other areas of natural interest, which will also be submitted to the testing cycle mentioned above.

In the near future, the website of the project, www.predinatur.pt**,** will also be available in Portuguese, Spanish and English, to facilitate the exchange of ideas related to the present issue among the research community.

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